CAZON AF200 -1994 576

## **Economics Information**

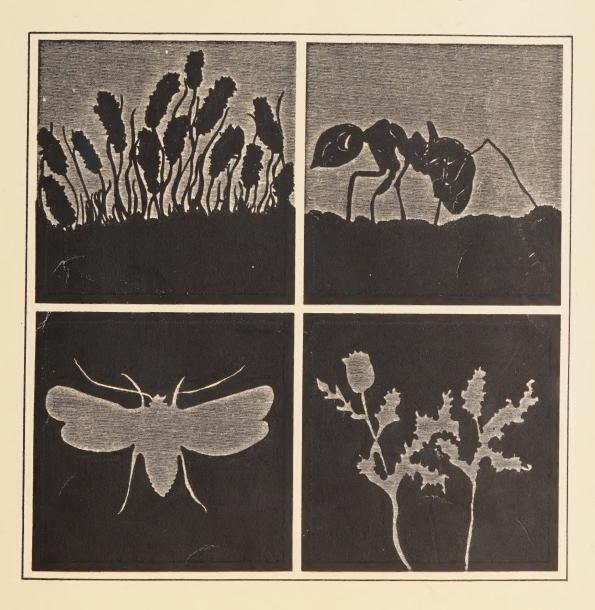


Ministry of Agriculture, Food and Rural Affairs

ISSN 0708-482X

REPORT NO. 94-01

## Survey of Pesticide Use in Ontario, 1993





https://archive.org/details/31761114695265

## ECONOMICS INFORMATION REPORT No. 94-01

SURVEY OF PESTICIDE USE IN ONTARIO, 1993 Estimates of Pesticides Used on Field Crops, Fruit and Vegetable Crops, Provincial Highway Roadsides, and by Licensed Pesticide Applicators

by

Craig Hunter
Resources and Regulations Branch

and

Bill McGee Policy Analysis Branch

Published by:

Policy Analysis Branch
Ontario Ministry of Agriculture, Food and Rural Affairs
Legislative Buildings, Queen's Park
Toronto, Ontario
M7A 2B2
November 1994

ISBN 0-7743-9959-7

November 1994

#### TABLE OF CONTENTS

		Page
ACKNOW	TLEDGEMENTS	. iv
INTRODU	JCTION	1
Sample Expand F F	OF PESTICIDE USE ON FIELD CROPS, FRUIT AND VEGETABLES e Selection and Editing ding the Sample Data Field Crops Truit and Vegetable Crops Additional Notes	2
Presen	Y OF RESULTS tation	
REFEREN	CES	. 31
	LIST OF APPENDICES	
Appendix		
I	Examples of Methodology Used in the Estimation of Pesticide Use at the County Level	8
II	Quantities of Specific Pesticide Active Ingredient Used on Field Crops in Ontario, 1993	. 11
III	Quantities of Active Ingredients of Each Type of Pesticide Used on Field Crops in 1993, by County and District, Ontario	. 12
IV	Quantities of Active Ingredients of Each Type of Pesticide Used on Fruit Crops in 1993, by Crop, Ontario	. 13
V	Quantities of Active Ingredients of Each Type of Pesticide Used on Vegetable Crops in 1993, by Crop, Ontario	
VI	Quantities of Specific Pesticide Active Ingredient Used on All Fruit in Ontario, 1993	. 14
VII	Quantities of Specific Pesticide Active Ingredient Used on All Vegetables in Ontario, 1993	. 15

#### LIST OF APPENDICES (continued)

Ap	pendix	Pa	ge
	VIII	Quantities of Active Ingredients of Each Type of Pesticide Used on Fruit Crops in 1993, by County and District, Ontario	16
	IX	Quantities of Active Ingredients of Each Type of Pesticide Used on Vegetable Crops in 1993, by County and District, Ontario	17
	X	Area Grown and Sprayed, and Quantities of Active Ingredients of Pesticides Used on Field Crops, Fruit and Vegetables in Ontario, 1993	18
	XI	Quantities of Specific Pesticide Active Ingredients Used on Field Crops, Fruit and Vegetables in Ontario, 1993	19
	XII	Quantities of Active Ingredients of Each Type of Pesticide Used on Field Crops, Fruit and Vegetables in 1993, by County and District, Ontario	20
	XIII	Comparison of Total Active Ingredients Used on Major Crops and for Selected Pesticide Groupings, 1983, 1988 and 1993	21
		omparison of Total Active Ingredients Used per Hectare on Major Crops d for Selected Pesticide Groupings, 1983, 1988 and 1993	21
	XV	Quantities of Specific Pesticide Active Ingredients Used by MOEE Licensed Pesticide Applicators, 1993	22
		stribution of Total Active Ingredients Used Classified by Land Type, for OEE Licensed Pesticide Applicators, 1993	22
		Quantities of Specific Pesticide Active Ingredients Used on Provincial Highway Roadsides	23
		LIST OF FIGURES	
Fig	ure		
	2. 3. 4.	Map of Ontario Showing Counties and Districts	<ul><li>26</li><li>27</li><li>28</li></ul>
	5. 6.	Agricultural Use of Fungicides in Ontario, 1993	29 30

#### **ACKNOWLEDGEMENTS**

This report could not have been produced without the valuable assistance of many people. The contributions of the following individuals are gratefully acknowledged.

Sivendiran Mailvaganam, on contract with OMAFRA for this survey, for statistical analysis and preliminary data tabulation.

Brad Stephenson, Policy Analysis Branch, Ontario Ministry of Agriculture, Food and Rural Affairs for generating the maps depicting the intensity of use for the various pesticide types in Ontario.

Mafat Patel, Policy Analysis Branch, Ontario Ministry of Agriculture, Food and Rural Affairs for designing the sample of producers selected for the survey.

Heather House and Heather Lassaline, Environmental Youth Corps students who tabulated the survey results.

Wanda Michalowicz from the Ministry of Environment and Energy for the survey of "licensed applicators".

Finlay Buchanan from the Ministry of Transportation for the roadside data.

We also acknowledge financial assistance for the survey from Environment Canada, Ecosystem Health Division.

Finally, appreciation and many thanks are extended to all the Ontario farmers and licensed applicators who responded to the surveys.

#### INTRODUCTION

Organic pesticides have been used in Ontario since the end of the second World War. The concern expressed by many groups regarding the contamination of fish and wildlife resulted in the need to identify and quantify the pesticides used in the Great Lakes Watershed.

Canada and the United States signed the Great Lakes Water Quality Agreement in 1972. The International Joint Commissions (IJC) acting for the two governments, oversees all activities in pursuance of this Agreement. As part of the Water Quality Agreement, the IJC established the Pollution from Land Use Activities on water quality. These activities include those involved with agriculture as well as forestry, city and urban areas, highways, and other industries. Documentation of the volume of each pesticide used in Ontario at both the county and watershed levels was essential to these studies.

The PLUARG group requested in 1972 that a survey of pesticide use be carried out every five years in the Province to identify and quantify the pesticides used in the Great Lakes Watershed. The data collected would be useful in estimating pesticide use in pursuance of the IJC Agreement; detecting trends in pesticide use by crop and by region in Ontario; and gauging the local and overall effectiveness of this Ministry's extension work in pest and weed control.

Since 1973, surveys of **agricultural** pesticide use have been carried out every five years by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) in consultation with personnel from the Ontario Ministry of the Environment, Agriculture Canada and the Crop Protection Institute. The technical aspects of these surveys have been handled primarily by the Statistics Section of OMAFRA's Policy Analysis Branch. The results appeared in Survey of Pesticide Use in Ontario, 1973 (1), 1978 (2), 1983 (3) and 1988 (4). These reports dealt with three aspects of pesticide use: field crops, fruit and vegetable crops and roadside spraying (except in 1988).

The 1993 survey of pesticide use was expanded beyond field crops and fruit and vegetables to include uses in highway maintenance and by licenced commercial applicators. These uses by licenced applicators were tabulated by active ingredient applied in six use areas: residential, golf courses, parks/playgrounds, cemeteries, commercial/industrial and forestry/woodlot.

#### SURVEY OF PESTICIDE USE ON FIELD CROPS, FRUIT AND VEGETABLES

#### Sample Selection and Editing

In Ontario, growers must comply with training requirements relating to pesticide use in order to purchase and apply pesticides to their crops. The list of registered producers is maintained by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) at the Ridgetown College of Agricultural Technology (RCAT).

This list was used as the sampling frame for the 1993 version of the Pesticide Use Survey. The sample of farms to be randomly selected from the list was designed to ensure sufficient coverage on a crop by crop basis, as well as to be representative geographically.

The selected farmers received Pesticide Use Record Forms in April 1993. They were requested to maintain these forms during the crop growing season by noting spraying details such as crops treated, chemical products and concentrations used, application rates, area grown, area sprayed, and dates of application. A summary questionnaire mailed to the same panel in the fall asked them to transfer the relevant information (i.e. the data required to calculate total amount of active ingredient used) and return the form to RCAT for manual editing and data entry.

About 1,800 forms were returned with useful information. No names, addresses, telephone numbers or other personal identifiers accompanied these forms - in fact, the only geographic identifier was the county number. Each questionnaire was checked for consistency and completeness, and, as much as possible, appropriate adjustments were made for missing data.

Data processing, statistical analysis and tabulation of results were responsibilities of the Policy Analysis Branch. Quantities of active ingredients for each chemical were computed by multiplying area sprayed times concentration times application rate. To help ensure the plausibility of the results of these calculations, pesticide specialists, with the Agriculture and Food Laboratory Services Branch, scrutinized the estimates of active ingredient usage and reviewed application rates at various stages during the preparation of this report.

#### **Expanding the Sample Data**

#### 1. Field Crops

In order to estimate total pesticide usage on all farms, it is necessary to boost the sample results by calculating appropriate expansion factors. For field crops, the expansion factor for each crop in each county is unique provided sufficient sample coverage existed for the county; otherwise, regional expansion factors were used where required. These factors are calculated as the ratio of the total area of a particular crop in the county [region] to the area of that crop reported in the questionnaires returned from that county [region]. Please refer to Appendix I for a detailed example of this calculation.

In some counties, the estimated use of certain specific pesticides may be zero when, in reality, it is likely that these had been applied. There are two main reasons for this result:

- (a) the use of such pesticides was not detected in the sample; or
- (b) the area grown to a particular field crop, while existent, was still too small to be estimable in a county hence, no expansion factor could be computed.

In addition, it should be noted that some chemicals which are no longer licensed may still be reported as stocks in storage diminish.

#### 2. Fruit and Vegetable Crops

The first step was to estimate the total use of pesticides at the provincial level by applying raising factors to the sample data. These raising factors were calculated as the ratios of the 1993 provincial area of each fruit and vegetable crop to the corresponding area reported in the survey.

Pesticide quantities used at the county level were derived by employing proportional area breakdowns once the estimation of the active ingredients of each specific pesticide by crop at the provincial level was complete. The area distributions for these crops at the county level were based on Statistics Canada's 1993 Fruit and Vegetable Area Survey.

For the determination of pesticide use on fruit and vegetable crops, this method is preferable to that used for field crops. Fruit and vegetables tend to be small area crops. Low sample sizes for fruits and vegetables in some counties can produce distorted results for those counties. More stable results are obtained by first calculating a reliable provincial level estimate of pesticide use and then allocating to counties on the basis of area grown. The assumption here is that fruit and vegetable crops are chemically treated in a somewhat similar fashion regardless of their location in the province.

As noted with field crops, the sample occasionally had limitations in that certain pesticides or crops were not adequately represented and hence, pesticide use in such instances could not be estimated.

#### **Additional Notes**

As with recent versions of this survey, the scope of the 1993 Survey of Pesticide Use provides a measure of the agricultural use of pesticides on field crops and field grown fruit and vegetable crops. Greenhouse and nursery stock spraying is not included. Surfactants (oils), seed treatments and other types of agricultural pesticide use such as livestock sprays and rodenticides are also excluded.

Previous surveys of this type made use of township level data to construct estimates of pesticide use at the river basin level. Since township identifiers were not available with the 1993 survey, it is not possible to generate comparable drainage basin estimates.

#### SUMMARY OF RESULTS

#### Presentation

The results of the surveys are presented numerically in Appendixes II through XVII and visually in Figures 2 through 6. Specific pesticides have been listed by their common names in the tables to avoid bias towards trade names. Appendix XI lists all the common names reported in the survey.

Appendix II lists the area treated and total amount of active ingredient of each specific pesticide used for each field crop in the Province.

Appendix III shows the quantity of each type of pesticide used in Ontario on field crops aggregated at the county level. The groups of pesticides include triazine herbicides, phenoxy herbicides, other herbicides, insecticides, nematocides and growth regulators.

The quantities of pesticide active ingredients of each type of chemical applied to various fruit crops in Ontario during 1993 are shown in Appendix IV. Nursery stock spraying is excluded. The pesticides which are used on fruit are further broken down in Appendix VI which gives the specific pesticides used while Appendix VIII gives a county level breakdown.

Tabulations of pesticide use on major vegetable crops, excluding greenhouse vegetables are published in Appendix V. Breakdowns for each specific pesticide and county level tabulations for vegetables are available in Appendices VII and IX respectively.

Total pesticide use on field crops, fruits and vegetables is summarized in Appendices X through XII. Appendix X indicates the total area of major field crops, fruits and vegetables as well as the active ingredients of each pesticide applied.

Reporting of some pesticide use, and of some crop areas have been totalled where amounts of product used were low (under 200 kg A.I.) or areas grown small enough to breach confidentiality. Although reported as "other", these pesticides were included in the total amounts used.

#### Highlights

The report shows a continued decline in agricultural pesticide use since the survey was first conducted in 1973.

The overall decline from 1983 to 1988 was from 8,700 tonnes of active ingredient (A.I.) to 7,200 tonnes of A.I. This further declined in 1993 to 6,200 tonnes. Over the past 5 years, this amounts to a 13.3% decline. Overall, from 1983 to 1993, the decline has been 28.3%.

Atrazine use on field corn declined from 999,000 kg to 585,000 kg between 1988 and 1993, a drop of 41%. Labelling changes designed to lower rates and eliminate fall applications are clearly reflected in the 66% reduction since the 1983 survey.

Concurrently, glyphosate use in both corn and soybeans went up by 300%. This obviously reflects use for quackgrass control as an alternative to atrazine.

Metolachlor use in corn rose from 712,000 kg to 898,000 kg, a 26% increase. However, its use in soybeans dropped from 915,000 kg to 391,000 kg, a 57% decline. This reflects changing availability of alternatives in both crops.

Other major changes in corn include the following: EPTC in corn - 231,000 kg to 107,000 kg, a 54% decline; Butylate in corn - 106,000 kg to 85,000 kg, a 20% decline; Dicamba went from 124,000 kg to 242,000 kg, a 95% increase.

For soybeans, other major changes include Bentazon which went from 135,000 kg to 52,000 kg, a 61% decrease; Ethalfuralin went from 9,000 kg to 28,000 kg which is a 210% increase; Imazethapyr went from 0 kg to 59,000 kg; Linuron went from 170,000 kg to 83,000 kg which is a 51% decrease, and Trifluralin went from 103,000 kg to 60,000 kg, a 42% decrease.

It is significant to see the increase in the use of "newer" herbicide families which have been recently registered. Products such as fenoxaprop-p-ethyl, imazethapyr, quizalofop-ethyl and thifensulfuron-methyl are significant factors in the continued decline of pesticide use. These products, which are used at grams per acre rates, are replacing products which were used at kilograms per acre rates.

Corn rootworm insecticides as a group continued to decline in use as noted in the 1988 survey. In 1993, they dropped a further 35%. This reflects the major move to crop rotation, eliminating the need for this treatment.

Pesticide use in 1993 demonstrated the continued decline in use that was documented in the 1988 survey. Some criticism and doubt about the 1988 survey arose concerning the 17% decline in use from the 1983 figures. Some felt the drought conditions of 1988 influenced the result. However, it is clear from the 1993 survey, done in a "wet" year, that the decline continues at about the same rate. This further validates the declining use of pesticides in food and fibre production in Ontario.

In the fruit and vegetable sectors, increases in fungicide use in apples, strawberries, raspberries and grapes as well as the stone fruits can be directly attributed to the wet weather of 1993. Insecticide use remained steady due to resistance problems and lack of new registrations. Higher herbicide use in small fruit reflects growing acreage and better care. It is also directly attributable to use of "older" products at higher rates of A.I. per acre. The lack of new registrations of new technology is more evident in the fruit and vegetable sectors than in larger acreage crops such as corn and soybeans.

The new sections of the survey on non-crop pesticide use, reported in tables XV through XVII, speak for themselves. This is an attempt to quantify use on these areas. Since home and garden products, forestry and personal use pesticides are not reported, we lack a comprehensive total. However, these figures will help, as a first step, to quantify non-agricultural uses.

APPENDICES AND FIGURES

## Appendix I - Examples of Methodology Used in the Estimation of Pesticide Use at the County Level

#### Field Crops

The expansion factor for each crop in each county depends upon the total area of each crop in the county and the area of that crop (sprayed or not) reported in the returned questionnaires.

Example: Calculation of expansion factor for field corn in Kent County

Total area of corn in 1993 61,900 ha

Total area of corn reported in sample 4,195 ha

Therefore, the expansion factor for corn is: 61,900 / 4,195 = 14.8

For each record in the sample, the quantity of active ingredient of all chemicals was computed by multiplying area sprayed times concentration times application rate. The sample total for each pesticide used in a given county was then multiplied by the expansion factor for the corresponding treated crop to arrive at an estimate of the total quantity of active ingredient for a particular pesticide used in the county.

<u>Example:</u> Estimation of atrazine use on field corn in Kent County

Total quantity of active ingredient of atrazine used on corn in the sample was 3,985 kg.

Therefore, the total quantity of active ingredient of atrazine used on corn in Kent would be:

$$3,985 \times 14.8 = 58,978 \text{ kg}$$

#### Fruit and Vegetable Crops

For each record in the sample, the quantity of active ingredient of all chemicals was computed by multiplying area sprayed times concentration times application rate. The sample total for each pesticide was then multiplied by the expansion factor for the corresponding treated crop to arrive at an estimate of the total quantity of active ingredient for a particular pesticide used in the province.

Example: Estimation of fungicide use on apples in Ontario

The provincial level expansion factor for apples was calculated as 17.62. (This is the ratio of the total area of apples in the province to the area of apples reported in the survey.)

Total quantity of active ingredient of fungicide used on apples in the sample was 12,925 kg.

Therefore, the total quantity of active ingredient of fungicide used on apples in Ontario would be:

$$12,925 \times 17.62 = 227,742 \text{ kg}$$

Once the provincial level estimate of pesticide usage was determined, the total was allocated to counties on the basis of area grown.

Example: Estimation of fungicide use on apples in Grey County

From Statistics Canada's Fruit and Vegetable Area Survey, the area grown to apples in Grey County accounts for 17.65 percent of the provincial total.

Therefore, the total quantity of active ingredient of fungicide used on apples in Grey County would be:

$$0.1765 \times 227,742 = 40,196 \text{ kg}$$



Appendix II - Quantities of Specific Pesticide Active Ingredients Used on Field Crops in Ontario, 1993

Pesticide Used by Crop	Quantity	Pesticide Used by Crop	Quantity	Pesticide Used by Crop	Quantity
HERBICIDES	kg	HERBICIDES (cont'd)	kg	HERBICIDES (cont'd)	kg
Field Corn		Winter Wheat		Total Herbicides	4,143,523
2,4-D amines (p)	34,876	2,4-D amines (p)	31,998	I out Her breides	1,1 10,020
2-4DB (butyl ester) (p)	4,437	2-4DB (butyl ester) (p)	4,430		
acrolein (o)	2,707	bromoxynil (o)	2,356	INSECTICIDES	
atrazine (t)	585,208	dicamba (p)	6,566	E. H.C	
bentazon (o)	10,964	difenzoquat (o)	1,199	Field Corn	272
bromoxynil (o) butylate (o)	33,543	glyphosate (o)	40,059	carbofuran	372 339
cyanazine (t)	85,184 213,240	MCPA (p) MCPA/MCPB (p)	28,520 7,115	chlorpyrifos fonofos	7,162
dicamba (p)	241,832	mecoprop salts, acids (p)	4,701	phorate	4,557
EPTC (o)	107,384	other	210	tefluthrin	3,229
glyphosate (o)	71,862	Total	127,154	terbufos	37,477
linuron (o)	6,672		,	other	7,525
MCPA (p)	4,693	Spring Wheat		Total	60,662
mecoprop salts,acids (p)	848	2,4-D amines (p)	2,360	G 1	
metolachlor (o)	897,870	2-4DB (butyl ester) (p)	1,450	Soybeans	2 420
metribuzin (t)	404	bromoxynil (o)	1,439	mevinphos	3,439
pendimethalin (o)	46,364	dicamba (p)	244	terbufos	222
tallow fatty acid (o)	1,159	diclofop-methyl (o)	264	other	175
other Total	1,900	difenzoquat (o) glyphosate (o)	248 2,135	Total	3,836
Total	2,351,146	grypnosate (o)	4,866	White Beans	
Soybeans		MCPA (p) other	4,800	dimethoate	1,041
agral 90 (o)	382	Total	13,034	endosulfan	942
bentazon (o)	52,226	20441	10,004	Total	1,983
chloramben (o)	2,849	Oats		2000	1,703
clomazone (o)	14,064	2,4-D amines (p)	7,085	Tobacco	
ethalfluralin (o)	27,657	2-4DB (butyl ester) (p)	18,297	acephate	24,347
fenoxaprop-p-ethyl (o)	2,643	bromoxynil (o)	775	chlorpyrifos	2,904
fluazifop-butyl (o)	382	dicamba (p)	353	deltamethrin	968
glyphosate (o)	164,784	glyphosate (o)	5,261	permethrin	1,732
imazethapyr (o)	58,686	MCPA (p)	16,017	pirimicarb	437
linuron (o)	83,133	MCPA/MCPB (p)	2,940	other	280
metobromuron (o)	950	other	37	Total	30,669
metolachlor (o)	391,152	Total	50,765	Other Field Cross	
metribuzin (t)	252,819	Dowley		Other Field Crops	200
quizalofop-ethyl (o)	4,119	Barley	10 774	carbaryl	390
sethoxydim (o) tallow fatty acid (o)	1,136 1,208	2,4-D amines (p) 2-4DB (butyl ester) (p)	18,774 21,088	dimethoate	925 319
thifensulfuron-methyl (o)	639	bromoxynil (o)	2,809	endosulfan methamidophos	768
trifluralin (o)	60,094	dicamba (p)	2,257	other	417
other	14,179	difenzoquat (o)	3,715	Total	2,819
Total	1,133,103	glyphosate (o)	24,098	Total	2,017
20041	2,100,100	MCPA (p)	42,599	Total Insecticides	99,968
White Beans		MCPA/MCPB (p)	4,576		,-
bentazon (o)	16,916	mecoprop salts, acids (p)	1,057		
diquat (o)	1,453	propanil (o)	1,379	NEMATOCIDES	
EPTC (o)	1,083	other	472		
ethalfluralin (o)	4,084	Total	122,824	Tobacco	
fenoxaprop-p-ethyl (o)	2,492	Mr. 1G		1,3-dichloropropene	352,709
fluazifop-butyl (o)	924	Mixed Grain	1 < 050	acrylonitrile	779
glyphosate (o)	7,426	2,4-D amines (p)	16,279	chloropicrin	52,803
metobromuron (o)	26,056	2-4DB (butyl ester) (p)	26,861	dichloropropene	56,851
metolachlor (o)	28,185	bromoxynil (o)	3,212	metam-sodium	1,902
monolinuron (o)	5,668 11,832	dicamba (p)	1,594 25,054	methyl isothiocyanate  Total	72,075 <b>537,118</b>
trifluralin (o) other	845	glyphosate (o) MCPA (p)	41,658	. Otal	337,110
Total	106,964	MCPA/MCPB (p)	1,116	Total Nematocides	537,118
1 Ottal	100,704	mecoprop salts,acids (p)	1,769	_ 0 0000 0 1 00000000000000000000000000	227,110
Canola		other	3,307		
2,4-D amines (p)	285	Total	120,851	GROWTH REGULATO	RS
atrazine (t)	1,108		,		
ethalfluralin (o)	967	Rye		Tobacco	
glyphosate (o)	619	2,4-D amines (p)	7,575	ethephon	869
quizalofop-ethyl (o)	767	bromoxynil (o)	265	fatty alcohol	391,630
trifluralin (o)	6,944	dicamba (p)	277	fatty alcohol-emtrol	38,650
other	208	dichlorprop (o)	208	Total	431,149
Total	10,897	glyphosate (o)	303	Total Countly Described	421 140
		MCPA (p)	686	<b>Total Growth Regulators</b>	431,149
Hay and Pasture		mecoprop salts,acids (p)	2,016		
2,4-D amines (p)	10,796	Total	11,330	ALL DESTICIDES	
2-4DB (butyl ester) (p)	9,474	Tahaasa		ALL PESTICIDES	
ammonium sulfamate (o)	427	Tobacco	267	<b>Total Pesticides</b>	5,211,758
dicamba (p)	285	flamprop-methyl (o)	367 318	Total Testicides	5,211,730
glyphosate (o)	61,960	glyphosate (o)	978		
MCPA (p)	3,637	imazamethabenz (o) napropamide (o)	3,787		
		HADIODAITHUE (U)	2,707		
MCPA/MCPB (p)	434		2.177		
	620 <b>87,633</b>	pebulate (o) other	2,177 194		

Fungicide use for greenhouse and seed treatments is excluded. (t) triazine herbicide (p) phenoxy herbicide (o) other herbicide

Appendix III - Quantities of Active Ingredients of Each Type of Pesticide Used on Field Crops in 1993, by County and District, Ontario

Counties and Districts  Brant Elgin Essex Haldimand-Norfolk Hamilton-Wentworth Kent Lambton	Triazine	Herbicides Phenoxy	Other	Insecticides	Nematocides	Growth	Total
Brant Elgin Essex Haldimand-Norfolk Hamilton-Wentworth Kent Lambton		Phenoxy	Other	Insecticides	Nametooides	Danulatana	Total
Elgin Essex Haldimand-Norfolk Hamilton-Wentworth Kent Lambton				mocentiaes	Nematocides	Regulators	Total
Elgin Essex Haldimand-Norfolk Hamilton-Wentworth Kent Lambton				- kilograms -			
Essex Haldimand-Norfolk Hamilton-Wentworth Kent Lambton	17,669	12,047	49,272	1,894	114,086	13,559	208,526
Essex Haldimand-Norfolk Hamilton-Wentworth Kent Lambton	44,092	24,444	142,129	8,811	110,367	105,643	435,486
Hamilton-Wentworth Kent Lambton	51,871	11,751	141,118	3,474	-	-	208,214
Kent Lambton	32,156	22,012	108,938	18,079	247,321	236,775	665,281
Lambton	12,667	8,201	36,123	42	-	-	57,032
Lambton	95,011	27,251	241,626	4,680	-	17,800	386,368
	144,760	29,137	197,374	1,966	2,938	2,945	379,121
Middlesex	71,036	34,499	264,809	5,913	25,912	5,687	407,855
Niagara	15,769	7,515	19,162	88	-		42,534
Oxford	57,658	35,037	129,959	22,399	34,975	47,666	327,693
Southern Ontario	542,688	211,893	1,330,511	67,346	535,598	430,074	3,118,110
Bruce	23,756	26,658	63,865	381		-	114,660
Dufferin	3,074	9,014	17,661	293	12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-	30,042
Grey	11,597	21,822	27,630	481	_	_	61,530
Halton	5,658	7,634	39,781	72	_	_	53,145
Huron	86,142	47,016	135,292	9,694	_	_	278,144
Peel	9,318	8,095	33,446	2,024	_		50,859
Perth	32,572	43,307	138,623	11,253			225,754
Simcoe	34,313	34,488	102,835	123	1,521	1,075	174,355
Waterloo	11,564	21,190	42,880	480	1,521	1,075	76,114
Wellington	28,888	32,053	80,227	97	_		141,264
Western Ontario	246,881	251,276	682,239	22,875	1,521	1,075	1,205,866
VI CSCCIII OIICUIO	240,001	251,270	002,207	22,075	1,521	1,075	1,205,000
Durham	30,407	14,103	39,916	1,418	-	-	85,844
Hastings	8,828	6,417	8,942	-	-	-	24,187
Northumberland	9,422	18,709	31,679	-	-	**	59,810
Parry Sound	35	113	1,443	. 2	-		1,594
Peterborough	47,157	35,458	6,013	-	-	-	88,629
Prince Edward	4,249	2,374	6,689	-	_	-	13,312
Victoria	13,301	14,861	27,831	13			56,006
York	4,291	10,280	62,330	1,573	-	-	78,475
Central Ontario	117,690	102,317	184,844	3,007	Ap	•	407,857
Frontenac	6,072	5,169	2,011	_	_	_	13,252
Lanark	7,173	1,871	12,102	_	_	_	21,146
Leeds & Grenville	15,920	9,933	8,068	_	_		33,921
Lennox & Addington	6,960	4,607	5,774	_			17,342
Ottawa-Carleton	23,224	16,063	38,498	235	_	_	78,020
Prescott & Russell	30,892	13,547	48,221	6,397	_		99,057
Renfrew	6,808	5,162	7,160	4	_	_	19,134
Stormont, Dundas &	,	,	-,				15,151
Glengarry	52,107	16,049	117,521	104	_	_	185,781
Eastern Ontario	149,156	72,401	239,356	6,740	-	-	467,653
Northern Ontario	42	9,423	2,809				12,274
PROVINCE 1	1,056,457	647,310	2,439,758	99,968	537,118	431,149	5,211,760

Appendix IV - Quantities of Active Ingredients of Each Type of Pesticide Used on Fruit Crops in 1993, by Crop, Ontario

	Herbicides						Growth	
Crop	Triazine	Phenoxy	Other	Fungicides	Insecticides	Nematocides	Regulators	Total
					- kilograms -			
Apples	1,702	827	5,081	227,742	78,735	_	-	314,087
Blueberries	28	24	919	863	1	-	_	1,834
Cherries	-	320	168	16,787	3,870	-	31	21,176
Grapes	416	-	3,614	110,421	18,733	-	_	133,184
Peaches	-	-	828	43,738	22,809	_		67,375
Pears	204	-	454	17,627	11,017	-	-	29,302
Plums/Prunes	-	-	49	16,733	2,294	-	-	19,076
Raspberries	122	-	6,305	8,444	379	_	_	15,251
Strawberries	-	611	6,904	14,149	2,337	1,428	_	25,428
Other Fruit	-	-	92	1,004	301	-	-	1,398
Total	2,471	1,781	24,413	457,509	140,478	1,428	31	628,111

Appendix V - Quantities of Active Ingredients of Each Type of Pesticide Used on Vegetable Crops in 1993, by Crop, Ontario

		Herbicides					
Crop	Triazine	Phenoxy	Other	Fungicides	Insecticides	Nematocides	Total
				- kilogram	ns -		
Asparagus	716	. 132	1,870	-	329	•	3,046
Beets	-	_	368	-	-	-	368
Broccoli	-	-	-		1,264	-	1,264
Cabbage	-	-	29	10,577	9,104	+	19,710
Cabbage, Chinese	40	-	-	-	1,477	-	1,477
Carrots	2,227	-	1,636	30,808	8,664	-	43,336
Cauliflower	-	-	158	11,839	6,235	-	18,231
Celery	· -	-	-	817	873	-	1,689
Cucumbers	-	_	222	1,798	374	-	2,394
Garlic/Leeks	-	-	67	-	-	-	67
Green Beans	-	-	2,012	-	177	-	2,189
Lima Beans	~	-	-	-	-	-	-
Onions	-	-	6,727	23,785	5,011	-	35,523
Peas	194	1,578	8,258	-	-	<del>-</del>	10,030
Peppers	-	-	35	2,471	2,913	2,640	8,059
Potatoes	1,046	-	12,457	48,094	50,295	-	111,892
Pumpkin/Squash	-	-	948	1,112	738		2,797
Rutabagas	-	37	1,273	-	3,944	-	5,255
Spinach	-	-	-	-	101	40	101
Sweet Corn	2,096	108	8,069		13,069	-	23,342
Tomatoes	405	-	4,210	74,770	23,263	11,117	113,766
Other Vegetables	-	-	162	778	1,097		2,036
Total	6,683	1,855	48,501	206,849	128,926	13,757	406,573

Appendix VI - Quantities of Specific Pesticide Active Ingredients Used on All Fruit in Ontario, 1993

	m ond	1110, 1993	
Pesticide Used	Quantity	Pesticide Used .	Quantity
	kilograms		kilograms
HERBICIDES		INSECTICIDES	
2,4-D amines (p)	677	azinphos-methyl	37,067
2-4DB (butyl ester) (p)	320	carbaryl	6,985
chlorthal dimethyl (o)	1,537	carbofuran	597
dichlobenil (o)	6,198 ·	chinomethionat	972
diuron (o)	218	clofentezine	549
glyphosate (o)	8,103	cypermethrin	743
MCPA/MCPB (p)	634	diazinon	4,245
napropamide (o)	3,639	dicofol	8,372
paraquat (o)	2,005	dinocap	3,336
simazine (t)	2,467	endosulfan	5,454
terbacil (o)	2,109	formetanate hydro-chloride	1,535
other	757	malathion	229
Total	28,665	methomyl	1,703
	·	parathion	. 664
FUNGICIDES		phosalone	6,610
		phosmet	55,992
benomyl	335	pirimicarb	913
captan	151,421	propargite	4,134
copper oxychloride	1,798	other	378
copper sulfate	3,891	Total	140,478
dinitrocresol	204		210,110
dodine	3,688	NEMATOCIDES	
ferbam	14,736		
folpet	24,532	1,3-dichloropropene	952
iprodione	4,202	methyl isothiocyanate	476
mancozeb	116,880	Total	1,428
metalaxyl	435	2 0001	1,420
metiram	55,411	GROWTH REGULATORS	
myclobutinal	6,857	ONO WIN REGULATIONS	
sulfur	72,338	Total	. 31
triforine	539	1 Utili	. 31
other	241		
Total	457,509	GRAND TOTAL	628,111

<sup>(</sup>t) triazine herbicide

<sup>(</sup>p) phenoxy herbicide(o) other herbicideNote: Totals may not add due to rounding.

Appendix VII - Quantities of Specific Pesticide Active Ingredients Used on All Vegetables in Ontario, 1993

	in Onta	in Ontario, 1993									
Pesticide Used	Quantity	Pesticide Used	Quantity								
	kilograms		kilograms								
HERBICIDES		INSECTICIDES									
atrazine (t)	2,006	azinphos-methyl	34,916								
bentazon (o)	4,634	carbaryl	9,430								
bromoxynil (o)	737	carbofuran	14,245								
chloramben (o)	534	chlorfenvinphos	1,070								
chlorthal dimethyl (o)	614	chlorpyrifos	1,353								
diquat (o)	5,588	cypermethrin	11,917								
diuron (o)	. 622	diazinon	3,605								
EPTC (o)	2,227	dimethoate	7,536								
fenoxaprop-p-ethyl (o)	2,194	endosulfan	19,214								
fluazifop-butyl (o)	276	malathion	286								
glyphosate (o)	2,838	methamidophos	3,400								
linuron (o)	6,246	methoxychlor	3,791								
MCPA (p)	205	naled	2,787								
MCPA/MCPB (p)	1,461	parathion	5,301								
metobromuron (o)	2,012	permethrin	961								
metolachlor (o)	8,560	phorate	6,190								
metribuzin (t)	1,053	phosmet	1,480								
naptalam (o)	594	pirimicarb	507								
paraquat (o)	233	terbufos	582								
pendimethalin (o)	5,049	other	357								
prometryne (t)	2,825	Total	128,926								
sethoxydim (o)	305	A Ottal	120,020								
simazine (t)	710	NEMATOCIDES									
trifluralin (o)	4,959	NEWATOCIDES									
other	558	metam-sodium	9,416								
Total	57,040	methyl isothiocyanate	4,341								
Total	37,040	Total	13,757								
FUNGICIDES		Total	13,737								
benomyl	991	GRAND TOTAL	406,572								
chlorothalonil	115,613		,								
iprodione	268										
mancozeb	38,583										
maneb	49,440										
metiram	1,819										
other	134										
Total	206,849										
LUCAI	200,0-17										

(t) triazine herbicide(p) phenoxy herbicide(o) other herbicideNote: Totals may not add due to rounding.

Appendix VIII - Quantities of Active Ingredients of Each Type of Pesticide Used on Fruit Crops in 1993, by County and District, Ontario

			by Cou	nty and Distri	ict, Ontario			
Counties and Districts		Herbicides Phenoxy	Other	Fungicides	Insecticides	Nematocides	Growth Regulators	Total
Districts	Tridzine	Thenoxy	Offici	1 ungleides	- kilograms -	Ttermateer		
Brant	34	25	499	5,511	1,580	27		7,676
Elgin	160	101	797	22,645	7,736	29	2	31,470
Essex	157	78	884	27,312	9,046	27	_	37,503
Haldimand-Norfolk	266	247	2,228	44,308	14,214	198	4	61,463
Hamilton-Wentworth	110	74	868	18,559	5,566	. 55	2	25,233
Kent	36	36	459	6,187	1,980	26	1	8,725
Lambton	38	30	236	6,973	2,417	14	1	9,709
Middlesex	68	60	686	9,699	3,160	53	1	13,726
Niagara	559	259	4,910	172,044	48,814	55	19	226,659
Oxford	83	62	620	11,545	3,889	55	-	16,253
Southern Ontario	1,510	971	12,187	324,781	98,401	538	30	438,418
Bruce	11	11	325	1,395	358	19	-	2,119
Dufferin	2	2	47	218	60	2	-	331
Grey	303	154	1,100	40,701	13,988	17	-	56,263
Halton	37	36	645	4,952	1,582	47	69	7,298
Huron	33 43	21	227	5,429	1,750	16	-	7,475 8,884
Peel Perth	2	47 5	611	6,152 407	1,966 123	66 10	-	607
Simcoe	80	68	1,009	10,774	3,436	75		15,443
Waterloo	8	16	206	1,132	325	27	-	1,713
Wellington	12	23	410	1,835	475	44	_	2,798
Western Ontario	531	383	4,639	72,994	24,062	321		102,929
			Í					
Durham	103	71	848	14,075	4,666	46	1	19,809
Haliburton	1	1	15	167	53	1	-	239
Hastings	11	15	269	1,557	449	23	•	2,324
Muskoka	1	4	78 859	158	25	10	40	276
Northumberland	144	81	88 88	19,198	6,486	33	~	26,800
Parry Sound Peterborough	2 9	5 12	441	302 1,261	72 215	11 25	-	481
Prince Edward	41	33	343	5,928	1,931	22	•	1,962 8,297
Victoria	7	15	480	962	139	34		1,638
York	20	31	676	3,012	793	57		4,591
Central Ontario	340	268	4,096	46,618	14,829	262	1	66,415
Frontenac	4	6	132	529	135	12	_	818
Lanark	6	5	204	659	140	6	-	1,020
Leeds & Grenville	18	16	212	2,519	811	18	-	3,593
Lennox & Addington	4	10	232	661	130	21	-	1,059
Ottawa-Carleton	10	32	609	1,761	381	69	-	2,863
Prescott & Russell	8	14	493	923	. 128	31	-	1,597
Renfrew	7	9	316	942	174	18	-	1,466
Stormont, Dundas &								
Glengarry	25	28	510	3,526	1,044	41	-	5,175
Eastern Ontario	83	120	2,707	11,521	2,943	216	40	17,590
Algoma	. 1	4	63	147	28	10	-	253
Cochrane	-	1	16	33	5	2	-	58
Kenora	-	2	28	79	13	5	-	128
Manitoulin	1	5	6 117	10 201	1 24	1	-	18
Nipissing	1	2	53	83		12	-	361
Rainy River	2	12	225	407	8 55	4 29	-	150
Sudbury Thunder Bay	2	11	170	407	94	23	-	731
Timiskaming	2	2	105	155	12	5	•	779 281
Northern Ontario	8	40	<b>784</b>	1,595	241	91		2,758
PROVINCE	2,472	1,782	24,414	457,509	140,477	1,428	31	628,110
. AO THICE	2,772		~ 1,71.7	151,507	170,777	1,420	31	020,110

Appendix IX - Quantities of Active Ingredients of Each Type of Pesticide Used on Vegetable Crops in 1993, by County and District, Ontario

Counties and Districts	Triazine	Herbicides Phenoxy	Other	Eungicidae	Insecticides	MT	TT.
		1 Helloxy	Other	Fungicides	msecucides	Nematocides	Tota
				- kilogram	IS -		
Brant	182	9	707	5,059	3,137	262	9,35
Elgin	253	119	1,621	2,473	2,615	397	7,47
Essex	357	7	3,676	33,679	15,212	4,210	57,14
Haldimand-Norfolk	568	68	2,181	11,680	8,082	1,342	23,92
Hamilton-Wentworth	92	10	1,036	8,539	7,008	160	16,84
Kent	473	308	5,263	41,609	14,196	6,130	67,980
ambton	248	27	3,346	13,867	9,842	246	27,57
Middlesex	871	673	7,308	1,782	5,047	27	15,70
Viagara	19	2	311	1,610	776	128	2,84
Oxford	91	64	1,191	2,083	2,086	42	
Southern Ontario	3,153	1,286	26,640	122,382	68,002	12,943	5,55° <b>234,40</b>
	·				,		·
Bruce	12	1	72	176	139	11	41:
Oufferin	252	12	3,017	11,446	11,923	13	26,663
Grey	18	2	98	329	177	36	659
Halton	42	8	214	1,270	850	48	2,43
Huron	296	215	2,879	2,341	6,079	138	11,94
Peel	31	3	203	430	481	14	1,16
Perth	31	56	547	26	754	2	1,41
Simcoe	1,062	15	5,680	29,680	17,263	16	53,710
Waterloo	36	4	199	422	483	2	1,140
Wellington	38	6	258	564	863	5	1,73
Western Ontario	1,817	323	13,166	46,686	39,013	285	101,290
Durham	87	3	807	4,903	4,205	42	10,04
Haliburton	70	-	66	982	283	-	1,40
Hastings	62	16	320	130	407	11	. 940
Muskoka	2	-	8	25	13	1	4
Northumberland	409	162	1,858	3,807	2,627	32	8,895
Parry Sound	1	-	4	13	7	99	24
Peterborough	29	16	191	115	203	13	56'
Prince Edward	43	16	249	296	305	33	94:
Victoria	40	1	133	1,233	887	37	2,33
/ork	775	9	3,681	21,631	8,539	253	34,88
Central Ontario	1,518	223	7,316	33,135	17,475	421	60,089
Frontenac	10	1	39	41	56	2	149
Lanark	4	1	19	21	27	1	7:
eeds & Grenville	15	1	72	115	129	13	34
ennox & Addington	5	1	36	130	68	12	25
Ottawa-Carleton	49	9	267	1,158	903	35	2,42
rescott & Russell	18	-	189	743	738	7 .	1,69
Renfrew	6	-	27	36	50	3	12
tormont, Dundas &							
Glengarry	14	3	114	324	340	26	82:
Castern Ontario	120	16	763	2,569	2,311	97	5,87
Algoma	10	1	45	63	76	2	19
Cochrane	2	î	12	56	34	1	10.
Kenora	-	_	2	10	5		10
Manitoulin		_	1	3	2		
lipissing	5	_	34	72	98	_	21
tainy River	1	_	6	41	31	2	8
	12	2	73	177	171	3	43
udbury Chunder Bay	41	1	431	1,609	1,677	1	3,76
hunder Bay	4		13	47	32	-	9:
Timiskaming		-			2,126	8	4,908
Northern Ontario	75	5	616	2,078	2,120	0	7,700

Appendix X - Area Grown and Sprayed, and Quantities of Active Ingredients of Pesticides
Used on Field Crops, Fruits and Vegetables in Ontario, 1993

				Herbicides							Dagaantaga
Crop	Area Grown	Area Sprayed	Triazine	Phenoxy & Other	Total	Fungi- cides	Insecti- cides	Nemato- cides	Growth Regulators	Total Pesticides	Percentage of Usage by Crop
	- '000	) ha -				- to	nnes -				%
Corn	809.4	760.8	798.9	1,552.3	2,351.1	-	60.7	-		2,411.8	38.6
Soybeans	688.0	639.8	255.0	878.1	1,133.1	-	3.8	-	-	1,136.9	18.2
Dry Beans	40.5	39.3	-	107.0	107.0	-	2.0	-	-	108.9	1.7
Tobacco	28.6	28.6	-	7.8	7.8	-	30.7	537.1	431.1	1,006.8	16.1
Grains a	613.2	496.7	1.5	444.4	446.0	_	2.4		-	448.4	7.2
Canola	24.2	20.1	1.1	9.8	10.9	-	•	-	-	10.9	0.2
Hay & Pasture	1,462.6	61.4	-	87.6	87.6	-	0.4	-	-	88.0	1.4
Field Crops	3,666.5	2,046.8	1,056.5	3,087.1	4,143.5		100.0	537.1	431.1	5,211.8	83.4
Fruit	30.3	n/a	2.5	26.2	28.7	457.5	140.5	1.4	-	628.1	10.1
Vegetables	68.8	n/a	6.7	50.4	57.0	206.8	128.9	13.8	-	406.6	6.5
All Crops	3,765.6	n/a	1,065.6	3,163.6	4,229.2	664.4	369.4	552.3	431.1	6,246.4	100.0
% of Usage by P	esticide Gr	ouping	17.1	50.6	67.7	10.6	5.9	8.8	6.9	100.0	

a Includes spring and winter wheat, barley, oats, rye and mixed grain. n/a Not available.

Note: Estimates of total area sprayed shown above do not take into account multiple applications on the same field.

Appendix XI - Quantities of Specific Pesticide Active Ingredients Used on Field Crops, Fruits and Vegetables in Ontario, 1993

Pesticide Used	Quantity	Pesticide Used	Quantity	Pesticide Used	Quantity
	kg		kg		kg
HERBICIDES		INSECTICIDES		FUNGICIDES	
2,4-D amines (p)	134,869	acephate	24,347	benomyl	1,327
2-4DB (butyl ester) (p)	87,877	azinphos-methyl	71,983	captan	151,468
acrolein (o)	2,707	carbaryl	16,882	chlorothalonil	115,613
agral 90 (o)	445	carbofuran	15,213	copper oxychloride	1,798
ammonium sulfamate (o)	427	chinomethionat	972	copper sulfate	3,891
atrazine (t)	589,852	chlorfenvinphos	1,070	dinitrocresol	204
bensulide (o)	1,043	chlorpyrifos	4,597	dodine	3,688
bentazon (o)	84,740	clofentezine	549	ferbam	14,736
bromoxynil (o)	45,317	cypermethrin	12,780	folpet	24,532
butylate (o)	85,184	deltamethrin	1,085	iprodione	4,470
chloramben (o)	3,383	diazinon	8,022	mancozeb	155,463
chlorthal dimethyl (o)	2,151	dicofol	8,372	maneb	49,440
clomazone (o)	14,064	dimethoate	9,532		435
				metalaxyl	
cyanazine (t)	215,480	dinocap	3,336	metiram	57,230
dicamba (p)	255,528	endosulfan	25,930	myclobutinal	6,857
dichlobenil (o)	6,198	fonofos	7,162	sulfur	72,338
dichlorprop (o)	423	formetanate hydro-chloride	1,535	triforine	539
diclofop-methyl (o)	331	malathion	514	other	329
difenzoquat (o)	5,163	methamidophos	4,168	Total	664,358
diquat (o)	7,247	methomyl	1,835		
diuron (o)	840	methoxychlor	3,791		
EPTC (o)	113,030	mevinphos	4,391	NEMATOCIDES	
ethalfluralin (o)	32,707	naled	2,787		
ethametsulfuron-methyl (o)	254	parathion	6,072	1,3-dichloropropene	353,661
fenoxaprop-p-ethyl (o)	7,360	permethrin	2,976	acrylonitrile	779
flamprop-methyl (o)	367	phorate	10,747	chloropicrin	52,803
fluazifop-butyl (o)	1,632	phosalone	6,610	dichloropropene	56,851
glyphosate (o)	414,821	phosmet	57,472	metam-sodium	11,318
imazamethabenz (o)	978	pirimicarb	1,857	methyl isothiocyanate	76,892
imazethapyr (o)	60,062	propargite	4,134	Total	552,304
linuron (o)	96,218	tefluthrin	3,229		,
MCPA (p)	143,328	terbufos	38,282		
MCPA/MCPB (p)	18,277	other	7,140	GROWTH REGULAT	ORS
mecoprop salts, acids (p)	11,065	Total	369,372	ethephon	900
metobromuron (o)	29,781	Total	307,372	fatty alcohol	391,630
metolachlor (o)	1,327,315			fatty alcohol-emtrol	38,650
` _				Total	431,180
metribuzin (t)	254,276			Total	431,100
monolinuron (o)	5,813				
napropamide (o)	7,497			ALL PESTICIDES	
naptalam (o)	594				( 24( 442
paraquat (o)	2,298			Total	6,246,442
pebulate (o)	2,177				
pendimethalin (o)	51,414				
prometryne (t)	2,825				
propanil (o)	1,379				
quizalofop-ethyl (o)	5,246				
sethoxydim (o)	1,471				
simazine (t)	3,177				
tallow fatty acid (o)	3,279				
terbacil (o)	2,109				
thifensulfuron-methyl (o)	639				
trifluralin (o)	83,945				
umuami (0)					
other	625				

<sup>(</sup>t) triazine herbicide(p) phenoxy herbicide(o) other herbicideNote: Totals may not add due to rounding.

Appendix XII - Quantities of Active Ingredients of Each Type of Pesticide Used on Field Crops, Fruits and Vegetables in 1993, by County and District, Ontario

Counties and		Herbicides					Growth	
Districts	Triazine	Phenoxy	Other	Fungicides	Insecticides	Nematocides	Regulators	Total
				- kilo	grams -			
Brant	17,885	12,081	50,478	10,570	6,611	114,375	13,559	225,558
Elgin	44,506	24,663	144,548	25,118	19,162	110,792	105,644	474,433
Essex	52,384	11,835	145,679	60,991	27,732	4,236	-	302,858
Haldimand-Norfolk	32,990	22,326	113,346	55,988	40,375	248,860	236,779	750,665
Hamilton-Wentworth	12,868	8,284	38,027	27,098	12,616	216	2	99,110
Kent	95,519	27,595	247,349	47,796	20,856	6,156	17,801	463,072
Lambton	145,046	29,194	200,956	20,840	14,225	3,198	2,946	416,406
Middlesex	71,975	35,231	272,803	11,481	14,120	25,991	5,688	437,289
Niagara	16,346	7,776	24,383	173,654	49,678	183	19	272,039
Oxford	57,831	35,164	131,769	13,628	28,373	35,071	47,666	349,503
Southern Ontario	547,351	214,151	1,369,338	447,163	233,750	549,079	430,103	3,790,935
Bruce	23,779	26,671	64,262	1,571	879	30	-	117,191
Dufferin	3,328	9,028	20,725	11,664	12,276	15	-	57,036
Grey	11,918	21,978	28,828	41,030	14,646	53	_	118,452
Halton	5,737	7,677	40,640	6,222	2,504	94	-	62,875
Huron	86,471	47,253	138,397	7,770	17,522	154	_	297,567
Peel	9,392	8,144	34,259	6,582	2,447	80	-	60,904
Perth	32,605	43,368	139,229	434	12,130	12	-	227,779
Simcoe	35,455	34,572	109,525	40,454	20,823	1,611	1,075	243,514
Waterloo	11,607	21,210	43,285	1,554	1,288	28		78,972
Wellington	28,937	32,081	80,894	2,399	1,436	49		145,796
Western Ontario	249,229	251,981	700,044	119,680	85,951	2,126	1,075	1,410,086
Durham	30,597	14,177	41,570	18,978	10,289	89	1	115,700
Haliburton	72	1	81	1,148	336	1		1,639
Hastings	8,901	6,448	9,531	1,687	855	33	-	27,457
Muskoka	2	4	85	183	38	11		324
Northumberland	9,975	18,952	34,396	23,005	9,113	64	_	95,506
Parry Sound	38	118	1,535	315	81	11		2,099
Peterborough	47,196	35,486	6,645	1,375	418	37	_	91,158
Prince Edward	4,334	2,423	7,281	6,224	2,236	. 55		22,551
Victoria	13,349	14,877	28,443	2,194	1,038	72	_	59,974
York	5,086	10,321	66,688	24,644	10,906	310	-	117,954
Central Ontario	119,548	102,808	196,256	79,753	35,311	684	1	534,360
Frontenac	6,085	5,176	2,183	570	191	13	-	14,219
Lanark	7,183	1,876	12,325	680	168	7	_	22,238
Leeds & Grenville	15,953	9,951	8,351	2,633	940	30	_	37,858
Lennox & Addington	6,969	4,618	6,042	791	198	33		18,652
Ottawa-Carleton	23,283	16,104	39,375	2,919	1,519	103	_	83,303
Prescott & Russell	30,918	13,561	48,902	1,666	7,262	38	~	102,348
Renfrew	6,821	5,171	7,503	978	228	20	-	20,722
Stormont, Dundas &		,	,					,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Glengarry	52,146	16,080	118,145	3,851	1,488	68	_	191,778
Eastern Ontario	149,359	72,537	242,826	14,090	11,994	313	•	491,120
Northern Ontario	125	9,468	4,208	3,672	2,367	100	•	19,940
PROVINCE	1,065,612	650,945	2,512,672	664,358	369,373	552,302	431,178	6,246,440

Appendix XIII - Comparison of Total Active Ingredients Used on Major Crops and for Selected Pesticide Groupings, 1983, 1988 and 1993

		Active Ingredient Used			
Crop	Pesticide or Group	1983	1988	1993	
			- kilograms -		
field corn	alachlor	614,680	940	_	
	atrazine	1,719,840	999,410	585,208	
	metolachlor	491,020	712,170	897,870	
	all herbicides	3,653,310	2,491,370	2,351,146	
soybeans	alachlor	436,800	1,190	-	
·	metolachlor	325,450	915,170	391,152	
	all herbicides	1,281,880	1,694,770	1,133,103	
grains	all herbicides	376,140	491,320	443,620	
tobacco	all nematocides	1,610,610	766,810	537,118	
total field crops	all herbicides	5,411,260	4,984,560	4,143,523	
A	all pesticides	7,800,480	6,206,580	5,211,758	
total fruit	all fungicides	410,990	429,610	457,509	
	all pesticides	562,640	598,560	628,111	
total vegetables	all pesticides	356,120	396,330	406,573	
total crops	all pesticides	8,719,240	7,201,470	6,246,442	

Appendix XIV - Comparison of Total Active Ingredients Used per Hectare on Major Crops and for Selected Pesticide Groupings, 1983, 1988 and 1993

		Active Ingredient Used per Area Grown			
Crop	Pesticide or Group	1983	1988	1993	
			- kg/ha -		
field corn	all herbicides	3.47	2.90	2.90	
soybeans	all herbicides	3.52	3.27	1.65	
grains	all herbicides	0.44	0.58	0.72	
tobacco	all nematocides	39.77	31.56	18.78	
total field crops	all herbicides all pesticides	1.33 1.92	1.31 1.63	1.13 1.42	
total fruit	all fungicides all pesticides	14.47 19.81	14.81 20.64	15.10 20.73	
total vegetables	all pesticides	4.89	6.01	5.91	
total crops	all pesticides	2.10	1.85	1.66	

### Appendix XV - Quantities of Specific Pesticide Active Ingredients Used by MOEE Licensed Pesticide Applicators, 1993

Pesticide Used	Active Ingredient Used	Pesticide Used	Active Ingredient Used	
	kg		kg	
2,3,6-TBA	1,667	fenoxaprop-ethyl	286	
2,4-D	225,052	glyphosate	18,556	
2,4-DB	101,804	hexazinone	1,833	
acephate	485	iprodione	1,784	
aluminum phosphide	3,467	malathion	552	
amitrole	3,973	mancozeb	486	
Bacillus thuringiensis	40,116	MCPA	48,404	
benomyl	1,976	mecoprop	251,879	
bensulide	7,638	metiram	333	
bromacil	980	paraquat	398	
carbaryl	2,099	phenylmercuric acetate	3,747	
chloroneb	1,808	picloram	433	
chlorothalonil	5,831	quintozene	4,450	
chlorpyrifos	125,766	simazine	1,310	
chlorthal dimethyl	5,094	tebuthiuron	1,300	
diazinon	127,656	thiophanate-methyl	2,045	
dicamba	190,296	thiram	3,541	
dichlorprop	104,678	triclopyr	1,235	
dicofol	252	other	673	
dithiopyr	8,203	Total	1,302,086	

#### Notes:

#### Appendix XVI - Distribution of Total Active Ingredients Used Classified by Land Type, for MOEE Licensed Pesticide Applicators, 1993

Land Type	Percentage Share of Total Active Ingredients Used
	%
residential lawns	62.5
industrial lawns	7.9
parks	6.9
golf courses	4.6
cemetaries	0.5
roadsides	17.4
schools	0.2
Total	100.0

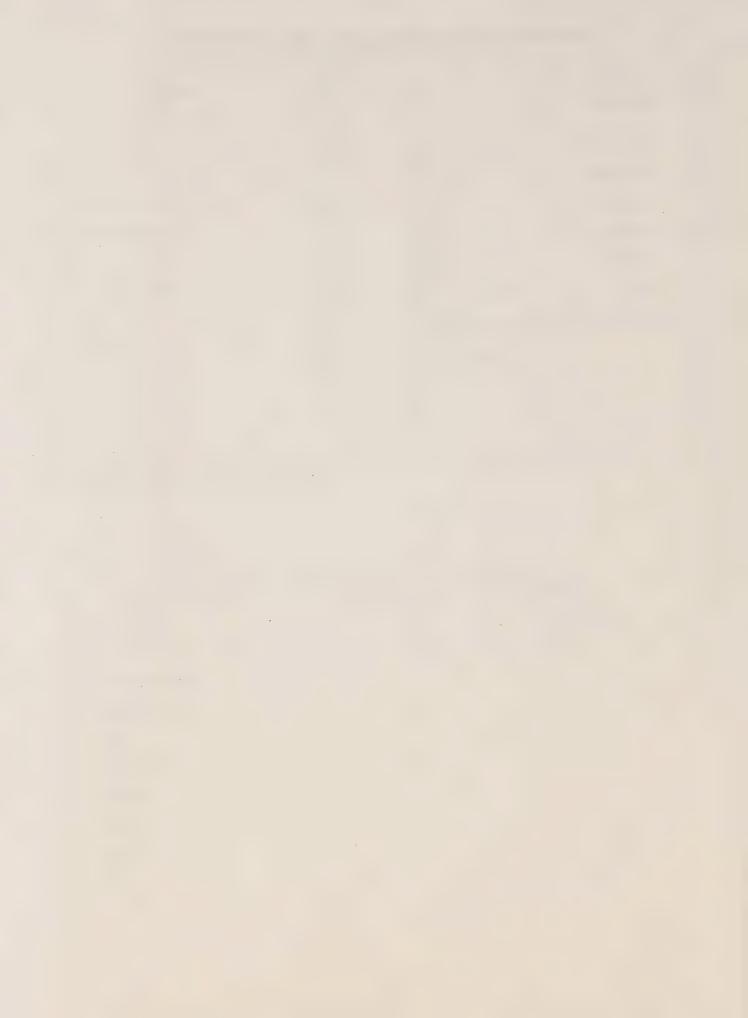
<sup>1.</sup> The response rate to the MOEE survey was about 30%. Therefore, an expansion factor of 10/3 was applied to the sample results to arrive at the estimates shown above.

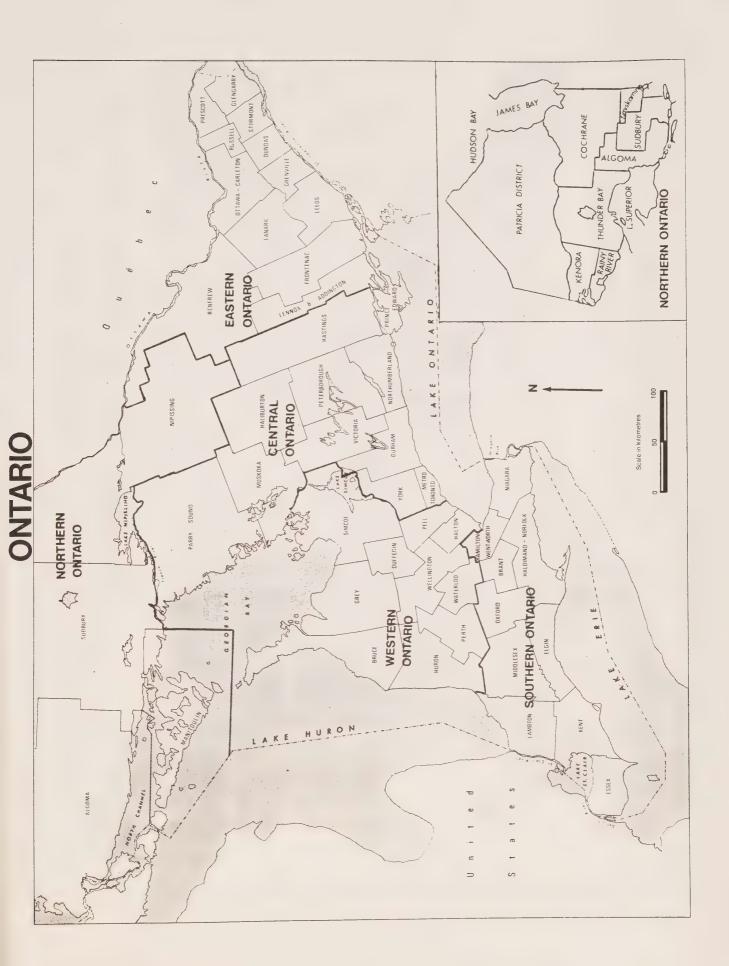
<sup>2.</sup> Figures exclude superior oil and seed treatments.

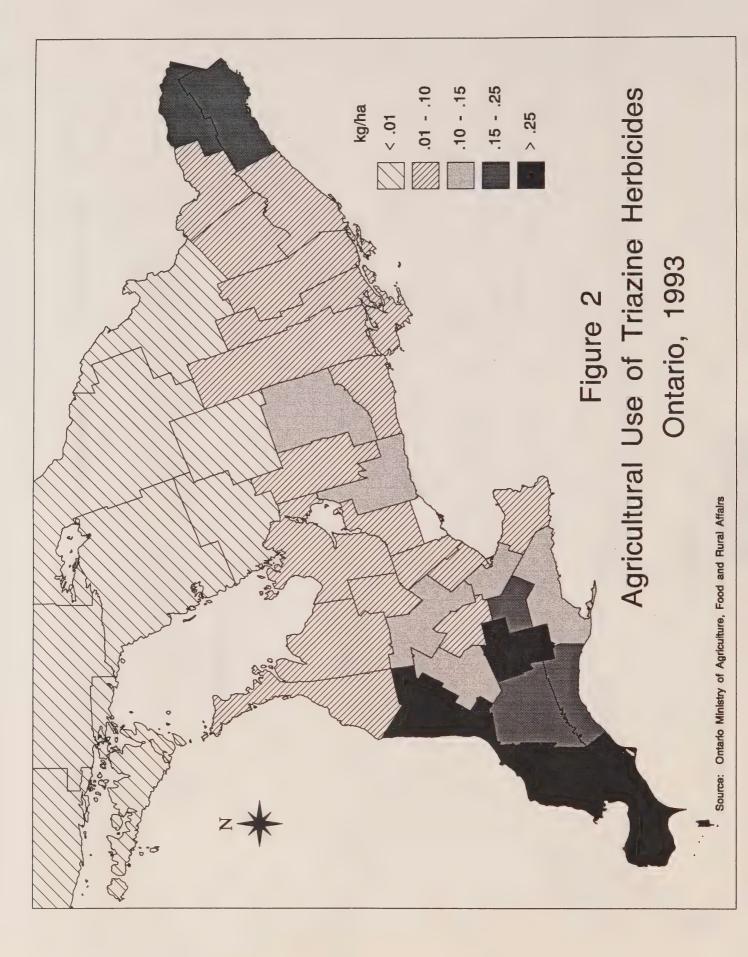
Appendix XVII - Quantities of Specific Pesticide Active Ingredients Used on Provincial Highway Roadsides, 1993

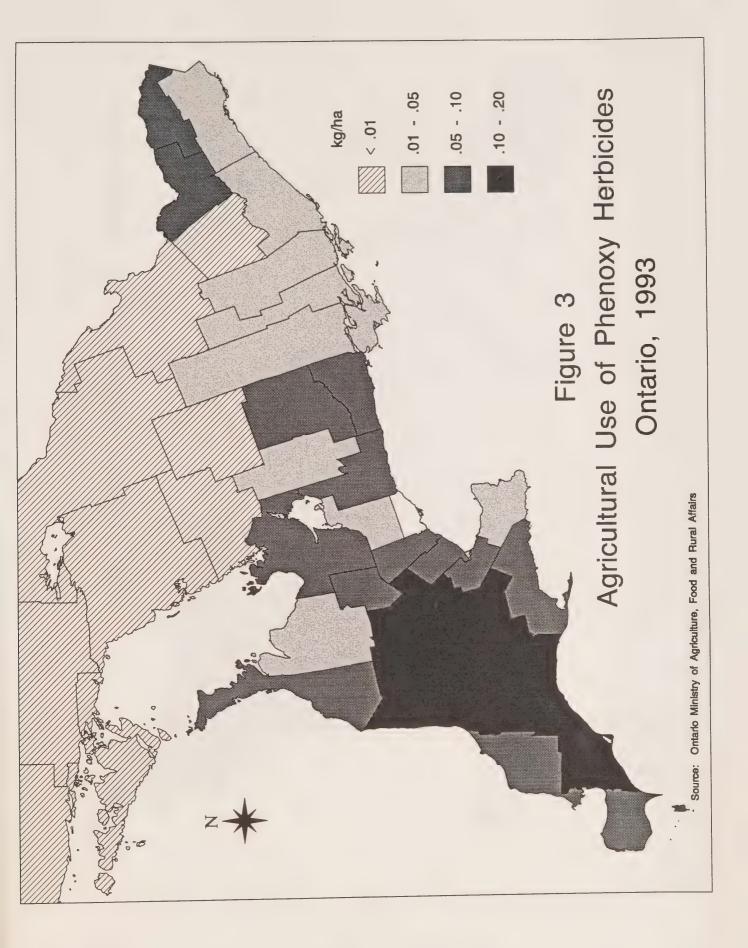
Pesticide Used	Area Treated	Active Ingredient Used
	ha	kg
2,4-D amine 600	1,298	2,744
chlorsulfuron	120	7
dichlorprop + 2,4-D	4,302	12,797
dicamba + 2,4-D	1,779	3,672
glyphosate	n/a	242
Total	n/a	19,462

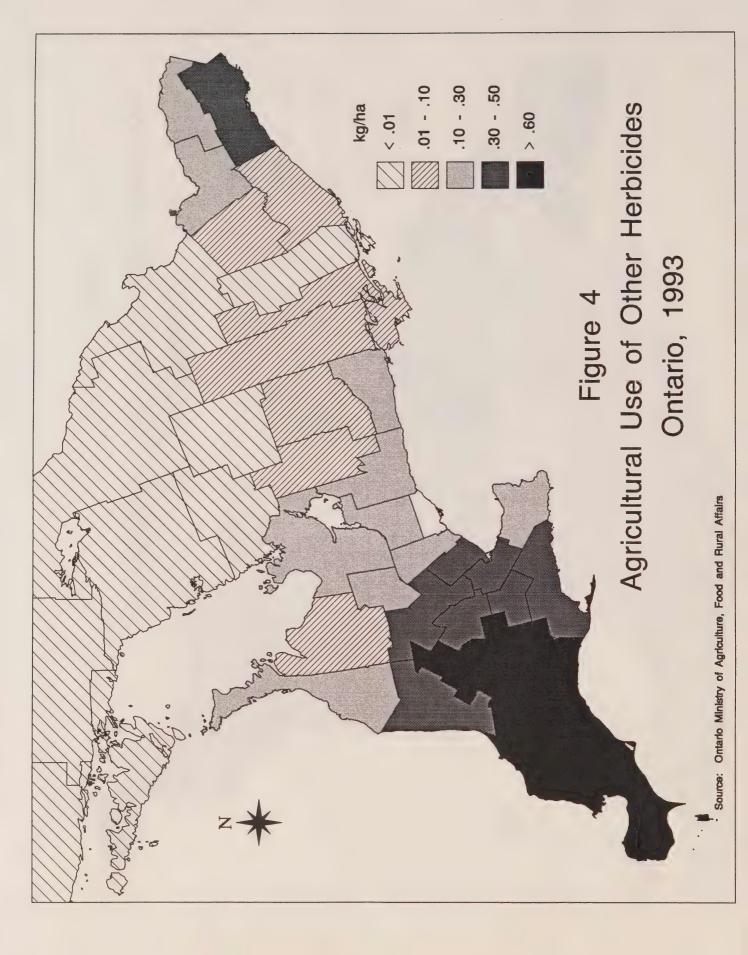
n/a Not available. Source: Ontario Ministry of Transportation.

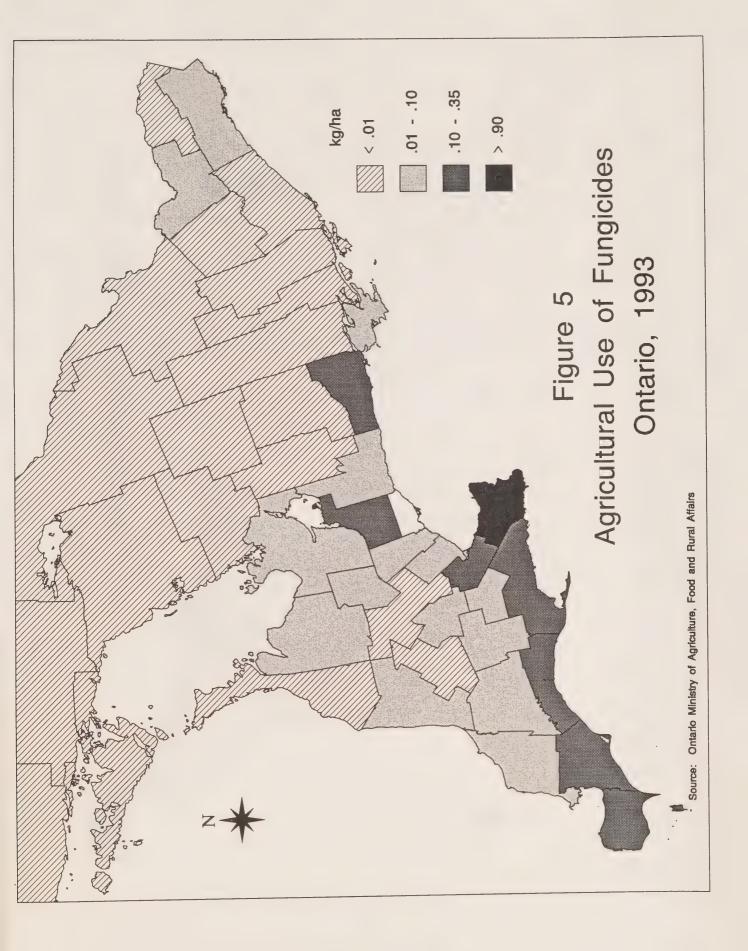


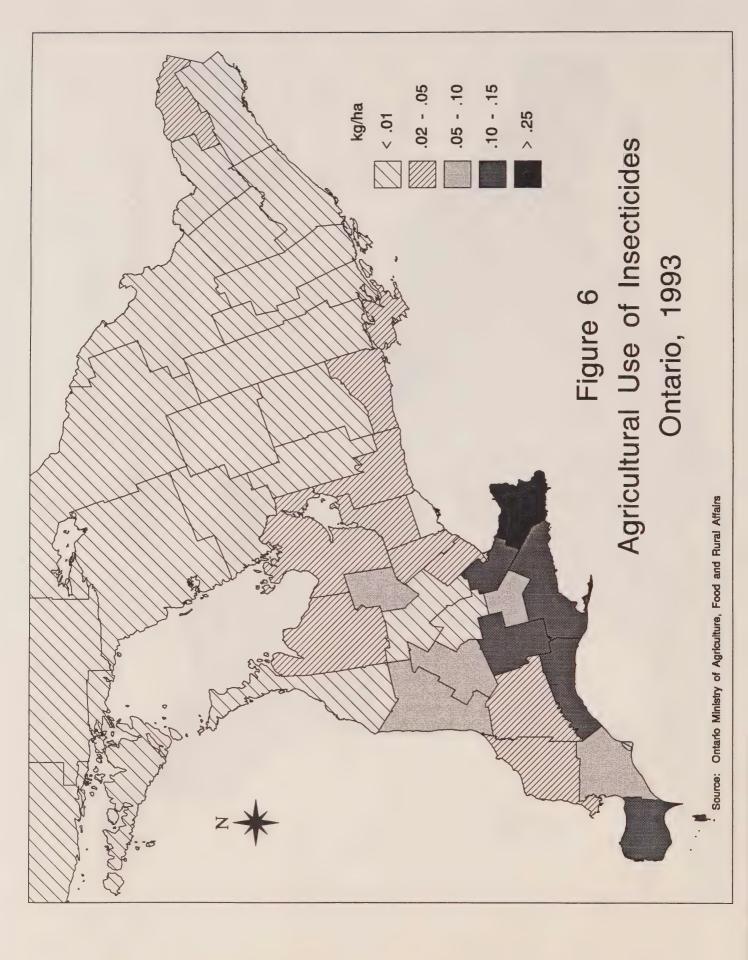












#### REFERENCES

- [1] Roller, N.F. Survey of Pesticide Use in Ontario, 1973. Economics Information. Toronto: Economics Branch, Ontario Ministry of Agriculture and Food, 1975.
- [2] Roller, N.F. Survey of Pesticide Use in Ontario, 1978. Economics Information. Toronto: Economics Branch, Ontario Ministry of Agriculture and Food, 1979.
- [3] McGee, W.G. Survey of Pesticide Use in Ontario, 1983. Economics Information. Toronto: Economics and Policy Coordination Branch, Ontario Ministry of Agriculture and Food, 1984.
- [4] Moxley, J. Survey of Pesticide Use in Ontario, 1988. Economics Information. Toronto: Economics and Policy Coordination Branch, Ontario Ministry of Agriculture and Food, 1989.
- [5] Ontario Ministry of Agriculture, Food and Rural Affairs. Database of producers registered for pesticide application. Ridgetown.
- [6] \_\_\_\_\_\_. Agricultural Statistics for Ontario, 1993. Publication 20. Toronto.
- [8] \_\_\_\_\_\_. 1994-1995 Fruit Production Recommendations. Publication 360. Toronto.
- [9] \_\_\_\_\_\_. 1994-1995 Vegetable Production Recommendations. Publ. 363. Toronto.
- [10] \_\_\_\_\_\_. 1994 Guide to Weed Control. Publication 75. Toronto.
- [11] Statistics Canada. 1993 Fruit and Vegetable Area Survey. Ottawa.
- [12] Statistics Canada. 1991 Census of Agriculture, Agricultural Profile of Ontario (Part 1). Catalogue No. 95-356. Ottawa.



# 3 1761 11469526 5

## RECENT PUBLICATIONS FROM THE POLICY ANALYSIS BRANCH OF THE ONTARIO MINISTRY OF AGRICULTURE, FOOD AND RURAL AFFAIRS

Agricultural Statistics for Ontario, 1993, by Statistical Services Unit.

Apple, Peach and Grape: Estimated Establishment Costs, Ontario, 1991, by E.D. McKibbon. Economics Information, Rept. No. 92-01, November 1991.

Vegetable Crops: Estimated Production Costs, Ontario, 1992 by Teresa Veenstra, E.D. McKibbon, and Barbara Burgess. Economics Information, Rept. No. 92-07, November 1992.

Fruit Crops: Estimated Production Costs, Ontario, 1992, by E.D. McKibbon, Economics Information, Rept. No. 92-08, November 1992.

Maple Syrup Production, Ontario, 1987, by Dirk Buth. Economics Information, Rept. No. 88-02, February 1988.

1991 Average Custom Farmwork Rates Changed in Ontario, by Barbara Burgess. Economics Information, Rept. No. 92-06.

Greenhouse Vegetable Production and Practices, 1991, by Teresa Veenstra, Economics Information, Rept. No. 92-09, November 1992.

Land Rental Rates in Ontario, 1991, by Alex Rosenberg, Economics Information Rept. No. 92-04, January 1992.

List of Branch Publications - 1993, Rept. No. 93-01, June 1993.

Single copies of the above publications are available on request from the Information Centre, Ontario Ministry of Agriculture, Food and Rural Affairs, Ground Floor, 801 Bay Street, Toronto, Ontario, M7A 2B2. (416) 326-3400.

ISBN 0-7743-9959-7

